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Haul-out behavior of common seal (Phoca vitulina L.) on selected hauling-out sites at the coast of Iceland

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Erlingur Hauksson

Haul-out Behaviour of Common Seal (Phoca vitulina L.) on selected Hauling-Out sites at the Coast of Iceland

INTRODUCTION

In Iceland, one method of estimating the size of the common seal (or harbor seal, Phoca vitulina L., comm. transl.) population involves counting seals from the air. Counting is either done directly from an airplane or by using aerial photographs (Erlingur Hauksson, 1985a). According to non-Icelandic research findings, along with the experience of the author of this paper, not all of the seals haul-out at any given time. It can therefore be difficult to estimate the total population (Summers and Mountford, 1975; Pitcher and McAllister, 1981). In some areas the tides appear to influence most strongly how many seals haul-out (Everitt and Braham, 1980; Sullivan, 1980; Schneider and Payne, 1983), in other areas time of day appears to have the greatest effect (Boulva and McLaren 1979). Disturbances by humans can also have considerable effect (Jorgensen 1979). Seasonal behaviour patterns of the seals can also influence the numbers that leave the water to haul-out. The greatest number of common seals appear to stay in the haul-out areas during birth of pups and immediately after the breeding period; which is the period when the seals shed their hair (Fancher 1982).

When seals are counted either from land or by using boats or airplanes, it must be done as effectively as possible. This means that counting should be done at that time of day when the greatest number of seals are visible in the haul-out areas. The objective of the research on common seal behaviour of this paper was to obtain information on what time of day the highest number of seals haul-out, along with examining the effects of the sun and tides on haul-out patterns. Previous seal censuses have been hampered by lack of information on these matters (Erlingur Hauksson, 1985a). It has been difficult, therefore, to organize censuses in a manner that would make it easy to determine the size of the seal population from the number of seals counted (see Eberhardt et. al. 1979).

METHODS

Common seals were observed from hiding places close to the haul-out areas. The hiding place in each area was chosen in a location where it would be easy both to observe the seals and move to and from the hiding place without disturbing them. This was one reason for constructing the hiding place on the offshore rock Oddbjarnarsker in Breidafjordur bay (West Iceland, comment from translator) (see fig. 1 and also the picture on page 52 in Ludvik Kristjansson, 1982).

A telescope on a tripod with a capability to enlarge 25 times was used. The seals were observed in the following areas along the coast of Iceland: Akraós in Mýrar (West Iceland, comment from translator) (fig. 2), the offshore rock Oddbjarnarsker in Breidafjordur Bay (West Iceland, comm. transl.), the offshore rock Vogasker in Isafjordur fjord (Northwest Iceland, comm. transl.) (fig. 3), Ofeigsfjordur fjord (Northwest Iceland, comm. transl.) (fig. 4) Hindisvik inlet at Vatnsnes peninsula (Northwest Iceland, comm. transl.) and Berufjordur fjord (East Iceland, comm. transl.) (fig. 5). All observations were done during the summer (May through August in 1980 and 1981). All seals that hauled-out and seals observed in the sea between high tides were counted. A count was usually performed every half hour; however, in some cases only every hour.

FINDINGS

The seals showed similar behaviour patterns in all the areas observed (see fig.6 and fig.7). Shortly after high tide they started hauling out, although some of them stayed out of the water during high tide in places where the sea did not go over the haul-out grounds. The number of seals hauling-out increased steadily as the water level continued to drop, the largest numbers being out of the water at and just after low tide (fig. 6 and fig. 7). It was common for the seals to move higher up on the

rocks as far as was possible, when the tide came in, apparently in order to continue to stay on dry land.

The haul-out pattern varied between the areas examined. In Hindisvik on May 4th 1980 (fig. 6), the first low tide is early in the morning (around 6.30 a.m.). A number of seals had by then already left the water, while this number was to increase rearching a maximum at 9 a.m. (table 1). Following this they moved one by one into the water as the tide came in, while around 20 seals still hauled-out at high tide, which was just after noon-time on that day. Shortly after the water started to withdraw, the seals moved one by one out of the water, as the beach and the rocks emerged from the sea. Around noon considerable numbers were hauled-out. The numbers increased with most seals being out of the water just after 9 p.m. . During late afternoon and evening, changes in the number of seals hauling-out were relatively minor. The same number of seals were ashore at 5 p.m. and 9 p.m. (around 60 in number), although just after 5 p.m. a number of them, for unknown reasons, went back into the sea. These same seals, or possibly other seals, then emerged one by one out of the water shortly after low tide.

The behaviour of seals at Akraos delta in Myrar (West-Iceland, comm. transl.) (fig. 7, in the upper left hand corner) was markedly different from that of seals in the other areas observed. When counting started just after noon-time, most of the seals were already hauling out. Their number increased only

slightly during the period 1.30 to 4.30 p.m. However, around the time when counting had just started, the seals were disturbed when an unidentified aircraft flew just above them with a loud noise. A large number of seals went into the sea. They then moved one by one again out of the water. However, some seals appear to have terminated hauling out that day, as the number of seals out of water never reached the same level as existed at the time before the plane flew over, even though the tide had not dropped significantly when this event occured.

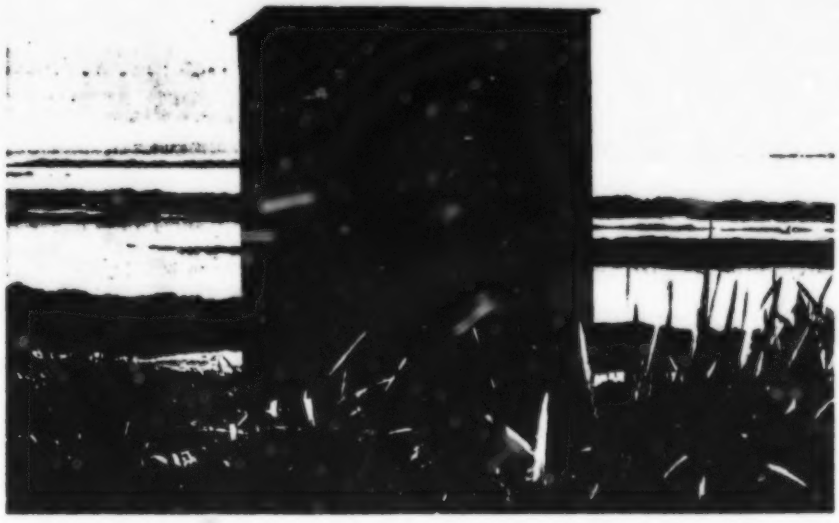
From obervations made on Sept 13th 1980 and June 21st 1981 in the offshore rock Oddbjarnarsker, it was found that the greatest number of seals were hauled-out at low tide. The seals gradually went into the water again as the tide came in. This pattern was particularly clear on June 21 (fig 7, table 1).

The seals behaved in a similar manner on the offshore rock Vogasker in Isafjardardjup bay (Northwest Iceland, comm. transl.), along with other areas observed. However, the patterns were not as clear as was observed on the rock Oddbjarnarsker. This could be expected as the haul-out rocks around Oddbjarnarsker become, unlike the rocks in the other areas examined, completely submerged during high tide. The highest number of seals were hauled-out on the rocks at, and just after, low tide. (fig 7, table 1).

In Ofeigsfjordur fjord (Northwest Iceland, , comm. transl.) and Berufjordur fjord (East Iceland, comm. transl.) the seals hauled out in a similar manner as described before. The only difference was that the greatest number of seals hauled-out of the water at a time considerably before low tide than in the other areas on the day of the observation (fig 7, table 1)

Time of day appears to have little effect on the number of seals hauling out. The tide appears to be the main factor affecting this behaviour (fig. 1). It should be pointed out, however, that observations were done during daytime, when it was light outside, and they do not tell us anything about seal behaviour in the dark. Observations of common seal appear to show that they do not haul-out in the dark but instead go at twilight time to hunt for food during the night.

Fig. 1



1. mynd. Útsýniskofi í Oddbjarnarskeri notaður til þess að fylgjast með selum – *The hiding-place in Oddbjarnarsker in Breiðafjörður, used for observations on hauling-out behaviour of common seals.* (Ljósm. / *photo* Erlingur Hauksson).

Fig. 2

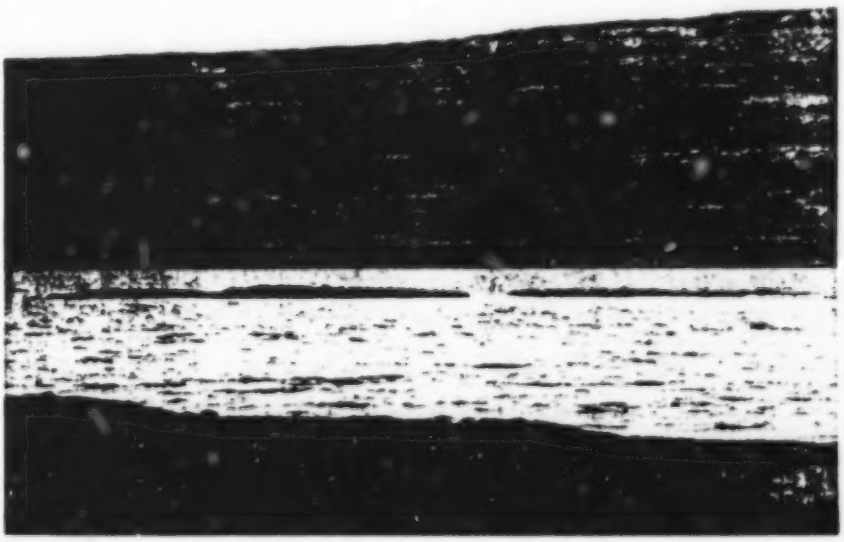
2. mynd. Séð yfir hluta Akraóss á Mýrum – *Akraós on Mýrar on the West-coast.* (Ljósm. / *photo* Erlingur Hauksson).

Table 1.

Tafla 1. Tími þegar mestur fjöldi sela er á landi, miðað við sjávarföll og sólargang. – *Time when the highest number of seals were seen on land, in relation to tides and the sunrun.* E. h.: *after midday*, f. h.: *before midday*, f. fj.: *before low tide*, e. fj.: *after low tide.*

Staður *Site*	Dags. *Date*		Hádegi kl. *Midday hours, min.*	Háfjara kl. *Low tide hours, min.*	Mestur fjöldi sela á þurru kl *Highest number of seal seen on land hours, min*	Tímamunur hámarksfjölda sela á landi (klst. mín.) og hádegis(A), háfjöru(B) *Time difference (hours, min.) between the highest number of seals on land and midday(A), low tide(B)* A		B	
Akraós, Mýrar	25. maí	1981	13,25	16,24	16,00	2,35	e. h.	0,24	f. fj.
Oddbjarnarsker,	13. sept.	1980	12,51	15,16	15,00	2,09	e. h.	0,30	f. fj.
Breiðafjörður	21. júní	1981	12,51	15,25	14,55	2,04	e. h.	0,16	f. fj.
Vogasker,	26. maí	1980	13,30	12,06	13,00	0,30	f. h.	0,54	e. fj.
Ísafjarðardjúp	25. júní	1981	13,30	19,58	20,00	6,30	e. h.	0,02	e. fj.
Ófeigsfjörður	15. júlí	1981	13,34	15,10	13,30	4,04	f. h.	1,40	f. fj.
Hindisvík,	4. maí	1980	13,07	6,30	9,05	0,04	f. h.	2,35	e. fj.
Vatnsnes	4. maí	1980	13,07	18,37	21,10	8,03	e. h.	2,33	e. fj.
Berufjörður	9. ág.	1981	13,01	16,59	18,00	4,59	e. h.	1,01	e. fj.
Að meðaltali – *Mean*						2,34	e. h.	0,46	e. fj.
Bil – *Range*						12,05		4,15	

Fig. 3.



3. mynd. Vogasker í Ísafirði, Ísafjarðardjúpi. – *Vogasker in Ísafjarðardjúp, northwestern Iceland.* (ljósm./*photo* Erlingur Hauksson).

A statisticly significant correlation relationship was not obtained when differences in the tide were correlated with the number of seals out of water in each of the areas examined (Table 2). The findings of this study were therefore lumped together into one, showing the number of common seals hauling out one hour before and one hour after low tide (fig 8).

There were usually seals in the water close to the haul-out areas (table 3). If a census is taken from a plane, the danger exists that some of the seals in the sea will not be counted. As practised in this study, it will be necessary to calculate directly the percentage of seals in the water when data obtained from aerial counts is corrected. The same needs possibly also be done when boats are used.

CONCLUSIONS

The observations in this study were only done during the summer months; the reason being that this is the season when the greatest number of seals can be expected to be in the haul-out areas. The objective of observing the behavior of the common seals in this study was to aid the taking of future censuses; mainly those taken from the air. The empirical material in this study can be compared with future studies on common seal behavior. The findings of this study could be of use in coordinating the times when seal censuses are taken; also

in calculating the actual number of seals from numbers observed through the use of a correction factor (table 4).

The correction factors shown here all come from areas where the effects of the tides can be felt. A clear relationship exists between tidal cycles and the numbers of seals hauled-out. In a non-Icelandic study done on common seals at Stage Point in Massachusetts in the United States, the effects of the tides were also clear (Schneider and Payne 1983). My own findings on the effect of the tides on the number of seals hauling-out do not differ from those findings in a statisticly significant manner.

Common seals are usually counted from a boat or an airplane. Seal censuses have been taken this way in the British Isles, Ireland, the Aleutian islands, and in other places. However, they tend to show, for a variety of reasons, the lower limit of the seal populations (Everitt and Braham, 1980; Summers and Mountford, 1975; Summers et. al. 1980). The following factors could explain this:

1) The timing of each census in relation to the tides and time of day when the greatest number of seal are out of the water, 2) The timing of a census in relation to the time of year when the greatest number of seals are either close to shore or hauling-out, 3) Human errors; such as for example when the people counting seals do not spot some seals hauling-out and do not see a great part of the seals in the water close to land, 4) The weather.

According to the findings of this study, the best time to take a census would be one and a half hours before and after low tide. In this time period over 75 % of the seals are out of the water, out of the total numbers that haul-out at all. If a census is performed with this in mind, the seals can be counted, as far as it remains light outside, over a period limited to three hours. Counting could possibly be done longer, when both low tides of each 24 hours occur during daylight

By limiting the census to this period and then multiplying the outcome with the appropriate correction factor (table 4), it becomes possible to obtain fairly comparable data on the number of seals in each area. This is possible if the other factors mentioned are held constant.

It will give the best result to do a census at the time of the year when the seals are closest to land; these are the breeding period and the period when the seals shed their hair. Around Iceland breeding takes place in the period May to June. After raising the pups the common seals shed their hair and mate (Bonner, 1972; Solmundur T. Einarsson, 1978). The best time to have a census around Iceland is therefore around the end of July and at the beginning of August. It is important to count around the time of mating, as after this period the number of seals hauling out decreases considerably (Fancher, 1982).

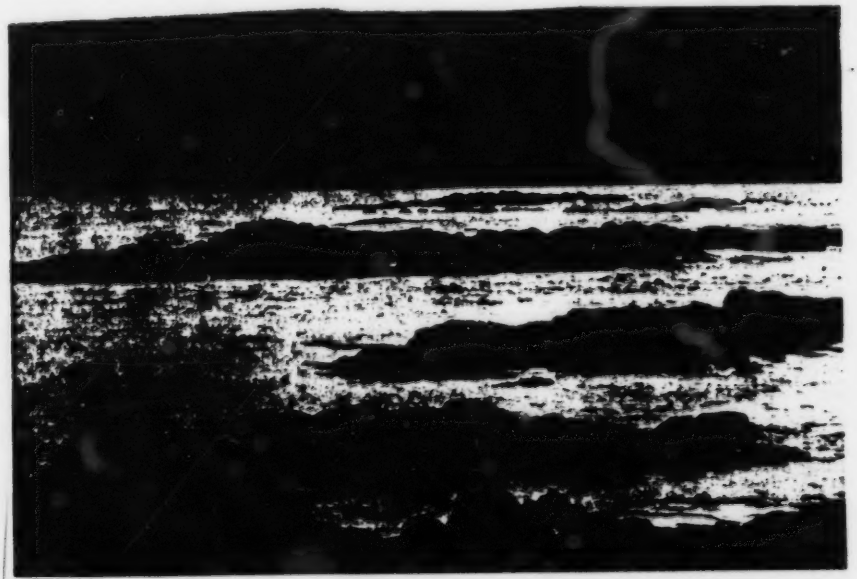
Table 2.

Tafla 2. Hlutfallsleg breyting á fjölda landsela á þurru og sjávarfallamunur. Miðað er við meðalbreytingu á fjölda dýra á klst. fyrir og eftir hámarksfjölda þeirra á landi.
Proportional changes in number of common seals on land and the difference of tides. Mean change in numbers of animals on land per hour before and after the maximum of animals hauled-out.

Staður *Site*	Dags. *Day*	Hlutfallsleg meðalbreyting í fjölda dýra á þurru á klst. fyrir og eftir hámarksfjölda þeirra á landi. *Proportional change in numbers of animals on land per hour before and after the maximum number.* Fyrir – *Before*	Eftir – *After*	Sjávarfallamunur (m)* *Tidal difference in meters*
Akraós	25. maí 1981	0,04	0,22	2,1
Oddbjarnarsker	13. sept. 1980	1,00	0,14	3,0
"	21. júní 1981	0,32	0,24	3,0
Vogasker	26. maí 1980	0,06	0,21	1,5
"	25. júní 1981	0,12	0,17	1,2
Ófeigsfjörður	15. júní 1981	0,31	0,03	1,1
Hindisvík	4. maí 1980**	0,07	0,20	1,0
"	4. maí 1980***	0,07	0,00	1,2
Berufjörður	9. ág. 1981	0,04	0,16	0,5
Fylgni meðalbreytinga og sjávarfallamunar (r) *Correlation between proportional mean-change and tidal differences (r).*		0,16	0,35	

*Við mat á sjávarhæð og sjávarfallamun er stuðst við þá staði, þar sem Sjómælingar Íslands (1980, 1981) gefa upplýsingar um sjávarföll. Ekki er leiðrétt m. t. t. loftþrýstings. – *Tidal height differences are estimated from tidal tables published by the Icelandic Hydrographic Service for the stations nearest to the respective study areas (barometric pressure is not taken into consideration).*
**Kl. 5 til 12 – *From 5 to 12 a. m.*
***Kl. 12 til 22 – *From 12 to 22 p. m.*

Fig. 4.



4. mynd. Hluti af þeim skerjum í Ófeigsfirði, þar sem fylgst var með hegðun sela. – *Some of the skerries in Ófeigsfjörður, where hauling-out behaviour of common seals were studied.* (Ljósm. / *photo* Erlingur Hauksson).

Table 3.

Tafla 3. Fjöldi landsela í sjó við látrin, er hámarksfjöldi dýra er á þurru. – *Numbers of seals in the water at the observations sites, when maximum number of animals are lying on land.*

Staður *Site*	Dags. *Date*		Hámarksfjöldi sela á þurru. *Maximum number of seals on land*	Fjöldi í sjó *Numbers in the water*	Hlutfallslegur fjöldi í sjó *Proportion in the water*
Akraós	25. maí	1981	193	2	0,01
Oddbjarnarsker	13. sept.	1980	44	0	0,00
"	21. júní	1981	172	3	0,02
Vogasker	25. júní	1981	74	2	0,03
Ófeigsfjörður	15. júlí	1981	64	1	0,02
Berufjörður	9. ág.	1981	18	0	0.00
Alls – *Total*			565	8	–
Meðaltal – *Mean*					0,01
95% öryggismörk – *95% confidence interval*					0,00 – 0,02

Table 4.

Tafla 4. Meðalstærð leiðréttingarstuðla við mismunandi tíma fyrir og eftir háfjöru, ásamt fjölda athugana. – *Mean correction coefficients for numbers of seals on land before and after low tide. N: number of observations, S.e.: standard error.*

Klst. fyrir og eftir háfjöru *Hours before or after low tide*	Meðalstærð leiðréttingarþátta* *Mean correction coefficient*	Fjöldi athugana *N*	Staðalfrávik *S.e.*
÷ 4,0	19,0	3	15,53
÷ 3,5	8,1	3	5,95
÷ 3,0	3,8	6	3,04
÷ 2,5	2,4	6	1,05
÷ 2,0	1,3	6	0,14
÷ 1,5	1,1	6	0,04
÷ 1,0	1,2	8	0,16
÷ 0,5	1,1	9	0,04
0,0	1,2	9	0,04
0,5	1,2	9	0,03
1,0	1,1	9	0,05
1,5	1,2	9	0,09
2,0	1,6	9	0,36
2,5	1,9	9	0,55
3,0	2,9	9	1,19
3,5	4,9	9	2,63
4,0	2,9	8	1,05

*Meðaltöl hlutfallsins hámarksfjöldi á landi/fjöldi á landi á hverjum tíma, tekið saman fyrir allar athuganir. – *Means of the proportion maximum number of seals on land/ number seen on land at a particular time. All observations grouped together.*

Human errors can be corrected by performing a test that should show if each person counting seals tends to put the number of seals in the water too low or too high. This has been done with persons counting seals in the water and when counting grey seal pups (Erlingur Hauksson 1985b).

The weather can influence both how clearly the seals can be seen when they haul-out and it can also influence the actual number of them leaving the water. On Sable Island, Canada, a relationship was discovered between temperature ashore (corrected by wind-chill factor) and number of seals hauling out (Boulva and McLaren 1979). On the days when seals are counted, it is therefore necessary that the weather be similar. Preferably the weather should be sunny, warm and calm.

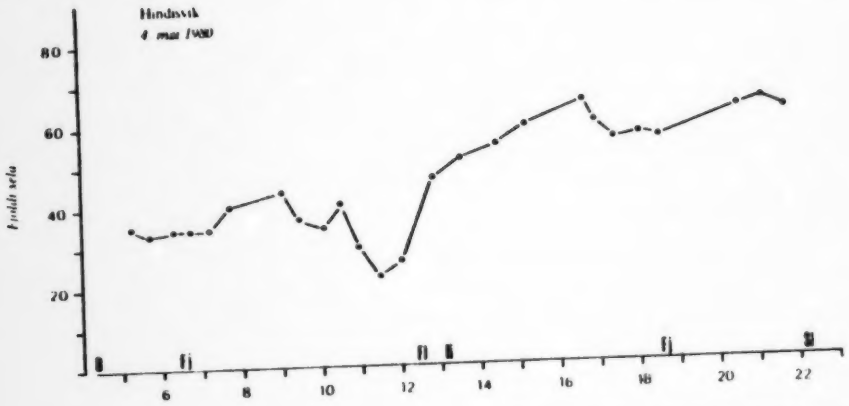
This study, despite its limits, along with non-Icelandic findings, appears to show that the seals are very closely linked to each area; they appear to come back again and again to the same place and even haul-out on the same rocks (Pitcher and McAllister, 1981; Slater and Markowitz, 1983). The fact that they are so faithful to the same location should improve the efficiency of counting from the air. However, the danger exists, that even if the procedures described here are followed and the numbers of seals observed are corrected to obtain total population, the final outcome is too low. A recent behavioral study on common seals in the Kodiak Islands

off Alaska, where transmitters were fastened on to the animals (study lasted May through September) apparently shows that the seals do not haul-out every day. Instead it appears that they come out of the water almost every other day (Pitcher and McAllister, 1981). According to this, census on Icelandic seals would only show half of the common seal population as the other half would be in the water. It is still my opinion that properly organized common seal censuses around Iceland, and comparisons of findings between years, should be a good indication of the condition of seals and provide information on population changes.

FIG. 5

5. mynd. Landselir á skerjum í Hindisvík – *Common seals in Hindisvík.* (Ljósm. / *photo* Erlingur Hauksson).

Fig. 6.

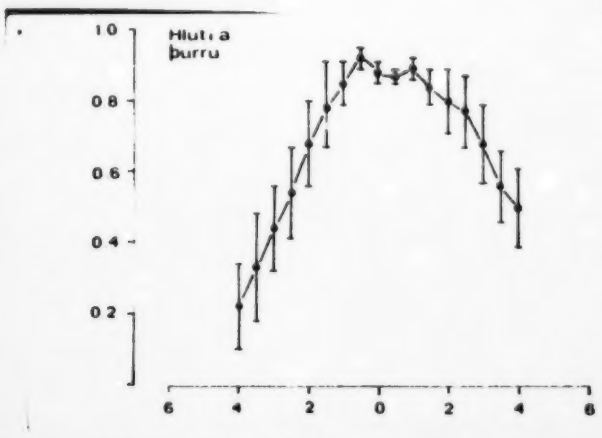


Changes in numbers of seals hauled-out, during the day at Hindisvík on Vatnsnes (north-western Iceland) on 4th of May 1980, B: *dawn,* H: *midday,* Fj: *low tide,* Fl: *high tide,* Sl: *sunset.*

Fig. 7.

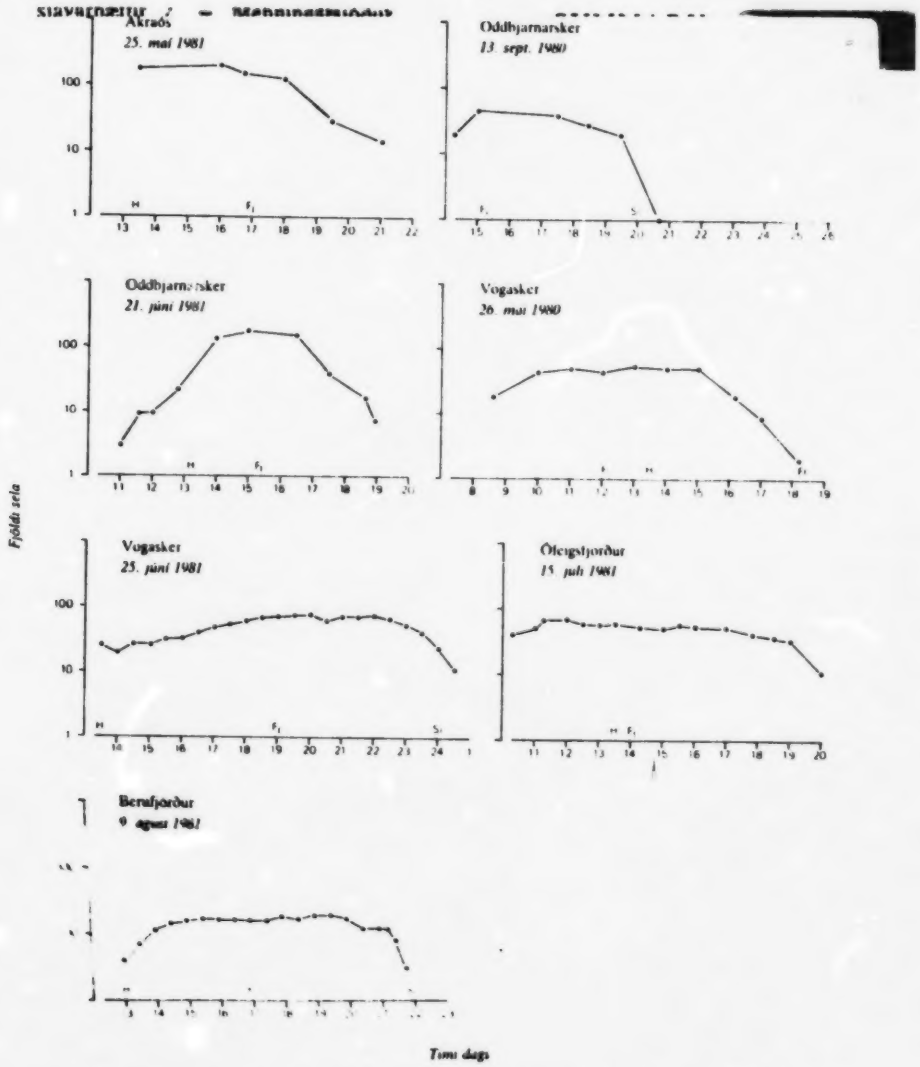
see next page.

Fig. 8.



8. mynd. Hlutfallslegur fjöldi landsela á þurru á mismunandi tímum fyrir og eftir háfjöru. Fjöldi athugana er stendur að baki hverju meðaltali á myndinni, er gefinn í töflu 4. Sýnd eru meðaltöl (punktar) og staðalfrávik (lárétt strik). – *Proportional numbers of common seals hauled-out, at different hours before and after low tide. Mean is shown by a dot and standard error by a bar.*

Fig. 7.



7. mynd. Breytingar á selafjölda á þurru eftir dagstíma á mismunandi stöðum við ströndina. Skýringar sjá 6. mynd. – *Changes in numbers of seals hauled-out during the day at various sites at the coast. For explanation see Fig. 6.*

/7B

SUMMARY

Haul-out behaviour of common seal (*Phoca vitulina* L.) on selected hauling-out sites at the coast of Iceland

by
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Haul-out behaviour of common seals (*Phoca vitulina*) was observed on seven sites at the coast (Figs. 6 and 7). The number of seals seen on land was highly influenced by the tides (Table 1 and Fig. 8). Highest numbers of animals on land were seen during and just after the low tide. These results are discussed in relation to aerial censuses of common seal. Correction factors are estimated for aerial counts, taking into consideration the proportion hauling-out in relation to the time of low tide (Table 4).

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